

REMARKS/ARGUMENTS

The Office Action mailed June 12, 2003, has been received and reviewed. Claims 1 through 4 and 15 through 25 are currently pending in the application. Claims 1 through 4 and 15 through 25 stand rejected. Applicants respectfully request reconsideration of the application in view of the arguments set forth below herein.

35 U.S.C. § 102(b) Anticipation Rejections

Anticipation Rejection Based on U.S. Patent No. 5,088,190 to Malhi et al.

Claims 1 through 4, 15 through 17, and 19 through 25 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Malhi et al. (U.S. Patent No. 5,088,190). Applicants respectfully traverse this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claims 1 through 4

Independent claim 1 is directed to an apparatus for routing interconnections among bond pads on a semiconductor die. The apparatus comprises: a sheet-like, nonconductive structure having a first surface, and *a second surface for attachment to said semiconductor die*; and *a plurality of electrically conductive discrete pads attached to said first surface*, the plurality of electrically conductive discrete pads *each having an electrical connect portion and an electrically isolated portion comprising a portion facing said first surface and a periphery defined thereabout*.

The Examiner cites Malhi as disclosing a semiconductor die comprising: "a sheet-like, nonconductive structure 30 having a first surface, and a second surface for attachment to the semiconductor die 11; and a plurality of electrical conductive discrete pads 32 attached to the

first surface, the plurality of electrically conductive discrete pads each having an electrical connection portion 32 and an electrical isolated portion 31 comprising a portion facing the first surface and a periphery defined thereabout." (Office Action, page 2). Applicants respectfully disagree with the Examiner's characterization of Malhi.

Malhi discloses a socket configured to facilitate the testing of an integrated circuit chip. The socket includes a socket unit 20 mounted within a socket frame 21 and a hinged frame lid 23. The socket unit 20 includes, among other things, a substrate 30 coupled with a foundation plate 27 both of which are mounted within a socket block 24. A compliant layer 31 is disposed on the substrate 30 and a connection circuit 32 adjoins the compliant layer 31. The connection circuit 32 includes wire bonds 25 which are connected with connector pins 26 extending through the socket block 24. Solder bumps 33 are attached to the connection circuit and provide an electrical interconnection with the semiconductor chip 11 which is to be tested. (See, e.g., col. 4, lines 45-62; FIG. 2). With respect to the connection circuit 32 (which the Examiner cites as being the plurality of electrically conductive discrete pads), Malhi states the following:

Connection circuit 32 is modeled from the data base of the integrated circuit chip to be tested. Thus, using conventional semiconductor device fabrication techniques, the data base of the integrated circuit chip 11 can be adapted to form test connection circuit 32. This integrated circuit [(i.e., the connection circuit)] can be formed by known integrated circuit fabrication techniques including etching a thin metal layer to form the integrated circuit. Furthermore, although FIG. 2 shows a solder bump 33 to connect to integrated circuit chip 11, this assumes that there is an associated landing pad on the chip 11. If, instead chip 11 has a solder bump with which connection circuit 32 must associate, a landing pad on connection circuit 32 can replace solder bump 33. (Col. 5, lines 14-27).

Applicants respectfully submit that the connection circuit 32 as taught by Malhi can not be construed as a plurality of electrically conductive discrete pads configured as set forth in claim 1 of the presently claimed invention. Malhi is quite clear that the connection circuit 32 is an "integrated circuit" modeled after that of the semiconductor chip 11 which is to be tested. Such an integrated circuit is not taught by Malhi to comprise a plurality of electrically conductive discrete pads configured as set forth in claim 1, nor is such a configuration to be assumed from a cross-sectional drawing which fails to show the entirety of the integrated circuit.

At best, Applicants submit that the conductive bumps 33 (or, alternatively conductive landings as set forth in the detailed description) may be considered discrete electrically conductive pads. However, if such conductive bumps 33 (or landing pads) are considered as electrically conductive discrete pads, such are clearly not configured with an electrical connect portion and *an electrically isolated portion comprising a portion facing said first surface and a periphery defined thereabout*. Rather, as is clear from Malhi's disclosure, such conductive bumps 33 are electrically coupled with the connection circuit 32 and, thus, don't include an electrically isolated portion comprising a portion facing said first surface.

Moreover, even if one assumed, arguendo, that Malhi taught a plurality of electrically conductive discrete pads as set forth in claim 1 of the presently claimed invention (and Applicants maintain their position to the contrary), the connection circuit 32 and/or conductive bumps 33 are disposed on or above the same surface which is to be attached to the semiconductor chip 11. In contrast, claim 1 of the presently claimed invention states that the plurality of electrically conductive discrete pads be disposed on the *first surface* of the sheet-like, nonconductive structure while the *second* surface is for attachment to the semiconductor die. Thus, Applicants submit that claim 1 is clearly allowable over Malhi, as Malhi fails to teach all of the limitations thereof.

Applicants further submit that claims 2 through 4 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claim 2, Applicants submit that Malhi fails to disclose at least one conductor extending between at least two of the plurality of electrically conductive discrete pads, wherein at least a portion of the at least one conductor is external to the sheet-like nonconductive structure.

Applicants, therefore, respectfully request reconsideration and allowance of claims 1 through 4.

Claims 15, 16 and 19 through 21

Independent claim 15 is directed to semiconductor device. The semiconductor device comprises: a die including a plurality of bond pads disposed on a surface thereof; an adapter having a first plurality of discrete electrical contacts on a first surface thereof, each electrically connected to one of said plurality of bond pads, and *a second plurality of discrete electrical contacts on a second surface thereof, each of said second plurality of discrete electrical contacts having an electrical connection portion and an electrically isolated portion comprising a portion facing said second surface of said adapter and a periphery defined thereabout*, at least some of said second plurality of discrete electrical contacts in electrical communication with said first plurality of discrete electrical contacts; and *a plurality of conductive bumps, each extending from one of said second plurality of discrete electrical contacts*.

The Examiner cites Malhi as disclosing a semiconductor die comprising: “a sheet-like, nonconductive structure 30 having a first surface, and a second surface for attachment to the semiconductor die 11; and a plurality of electrical conductive discrete pads 32 attached to the first surface, the plurality of electrically conductive discrete pads each having an electrical connection portion 32 and an electrical isolated portion 31 comprising a portion facing the first surface and a periphery defined thereabout.” (Office Action, page 2). The Examiner further cites Malhi, referring to FIG. 6 thereof, as disclosing “an adapter on the side with [the] plurality of contacts 626.” (Office Action, page 2). Applicants respectfully disagree with the Examiner’s characterization of Malhi.

As previously discussed, Malhi discloses a socket configured to facilitate the testing of an integrated circuit chip. The socket includes a socket unit 20 mounted within a socket frame 21 and a hinged frame lid 23. The socket unit 20 includes, among other things, a substrate 30 coupled with a foundation plate 27 both of which are mounted within a socket block 24. A compliant layer 31 is disposed on the substrate 30 and a connection circuit 32 adjoins the compliant layer 31. The connection circuit 32 includes wire bonds 25 which are connected with connector pins 26 extending through the socket block 24. Solder bumps 33 are attached to the connection circuit and provide an electrical interconnection with the semiconductor chip 11 which is to be tested. (See, e.g., col. 4, lines 45-62; FIG. 2).

As set forth above, Malhi teaches that the connection circuit 32 (which the Examiner cites as being the plurality of electrically conductive discrete pads), is an "integrated circuit" modeled after that of the semiconductor chip 11 which is to be tested. Applicants respectfully submit that the connection circuit 32 as taught by Malhi can not be construed as a plurality of electrically conductive discrete contacts located and configured as set forth in claim 15 of the presently claimed invention. Malhi does not teach that such an integrated circuit comprises a plurality of electrically conductive discrete contacts configured as set forth in claim 15, nor is such a teaching to be assumed from a cross-sectional drawing which fails to show the entirety of the integrated circuit.

At best, and as discussed above, the conductive bumps 33 (or, alternatively conductive landings as set forth in the detailed description) may be considered discrete electrically conductive contacts. However, if such conductive bumps 33 (or landing pads) are considered as electrically conductive discrete contacts, such are clearly not configured with an electrical connect portion and *an electrically isolated portion comprising a portion facing said second surface and a periphery defined thereabout*. Rather, as is clear from Malhi's disclosure, such conductive bumps 33 are electrically coupled with the connection circuit 32 and, thus, don't include an electrically isolated portion comprising a portion facing said second surface.

Moreover, even if one assumed, arguendo, that Malhi taught a second plurality of electrically conductive discrete contacts on a second surface of the sheet-like, nonconductive

structure as set forth in claim 15 of the presently claimed invention (and Applicants maintain their position to the contrary), Malhi fails to teach a first plurality of electrically conductive discrete contacts on a *first surface* of the *sheet-like, nonconductive structure*. Thus, Applicants submit that claim 15 is clearly allowable over Malhi, as Malhi fails to teach all of the limitations thereof.

Applicants further submit that claims 16 and 19 through 21 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claim 16, Applicants submit that Malhi fails to teach a protective coating over the at least a portion of the die wherein the plurality of conductive bumps are at least partially exposed through the protective coating.

With respect to claims 19 and 20, Applicants submit that Malhi fails to teach a conductive via extending between at least one of the first plurality of discrete electrical contacts (on the first surface of the sheet-like, nonconductive structure) and at least one of the at least some other of the second plurality of discrete electrical contacts (on the second surface of the sheet-like, nonconductive structure).

With respect to claim 20, Malhi fails to teach that at least one of the second plurality of discrete electrical contacts is electrically isolated from the plurality of bond pads disposed on the first surface of the die.

With respect to claim 21, Malhi fails to teach a semiconductor device wherein the adapter is adhesively secured to the die.

Applicants, therefore, respectfully request reconsideration and allowance of claims 15, 16 and 19 through 21.

Claims 17 and 22 through 25

Independent claim 17 of the presently claimed invention is directed to a semiconductor device. The semiconductor device comprises: a die including a plurality of bond pads disposed on a first surface thereof; an adapter having a first plurality of discrete electrical contacts on a

first surface thereof, each electrically connected to one of said plurality of bond pads, and a *second plurality of discrete electrical contacts on a second surface thereof, at least some of said second plurality of discrete electrical contacts being horizontally remote from at least some of the plurality of bond pads disposed on the first surface of the die, the at least some of said second plurality of discrete electrical contacts having an electrically isolated portion comprising a portion facing said second surface of said adapter and a periphery defined thereabout, and at least some other of said second plurality of discrete electrical contacts being electrically connected to said first plurality of discrete electrical contacts.*

The Examiner cites Malhi as disclosing a semiconductor die comprising: “a sheet-like, nonconductive structure 30 having a first surface, and a second surface for attachment to the semiconductor die 11; and a plurality of electrical conductive discrete pads 32 attached to the first surface, the plurality of electrically conductive discrete pads each having an electrical connection portion 32 and an electrical isolated portion 31 comprising a portion facing the first surface and a periphery defined thereabout.” (Office Action, page 2). The Examiner further cites Malhi, referring particularly to FIG. 6 thereof, as disclosing “an adapter on the side with [the] plurality of contacts 626.” (Office Action, page 2). Applicants respectfully disagree with the Examiner’s characterization of Malhi.

As previously discussed, Malhi discloses a socket configured to facilitate the testing of an integrated circuit chip. The socket includes a socket unit 20 mounted within a socket frame 21 and a hinged frame lid 23. The socket unit 20 includes, among other things, a substrate 30 coupled with a foundation plate 27 both of which are mounted within a socket block 24. A compliant layer 31 is disposed on the substrate 30 and a connection circuit 32 adjoins the compliant layer 31. The connection circuit 32 includes wire bonds 25 which are connected with connector pins 26 extending through the socket block 24. Solder bumps 33 attach to the connection circuit and provide an electrical interconnection with the semiconductor chip 11 which is to be tested. (See, e.g., col. 4, lines 45-62; FIG. 2).

As set forth above, Malhi teaches that the connection circuit 32 (which the Examiner cites as being the plurality of electrically conductive discrete pads), is an “integrated circuit” which is

modeled after that of the semiconductor chip 11 which is to be tested. Applicants respectfully submit that the connection circuit 32 as taught by Malhi can not be construed as a plurality of electrically conductive discrete contacts configured as set forth in claim 17 of the presently claimed invention. Malhi does not teach that such an integrated circuit comprises a plurality of electrically conductive discrete contacts located and configured as set forth in claim 15. Nor is such a teaching to be assumed from a cross-sectional drawing which fails to show the entirety of the integrated circuit.

At best, the conductive bumps 33 (or, alternatively conductive landings as set forth in the detailed description) may be considered discrete electrically conductive contacts. However, if such conductive bumps 33 (or landing pads) are considered as electrically conductive discrete contacts, such are clearly not configured with an electrical connect portion and *an electrically isolated portion comprising a portion facing said second surface and a periphery defined thereabout*. Rather, as is clear from Malhi's disclosure, such conductive bumps 33 are electrically coupled with the connection circuit 32 and, thus, don't include an electrically isolated portion comprising a portion facing said second surface.

Moreover, even if one assumed, arguendo, that Malhi taught a second plurality of electrically conductive discrete contacts on a second surface of the sheet-like, nonconductive structure as set forth in claim 17 of the presently claimed invention (and Applicants maintain their position to the contrary), Malhi fails to teach a first plurality of electrically conductive discrete contacts on a *first surface* of the *sheet-like, nonconductive structure*. Nor does Malhi teach that at least some of the second plurality of electrically conductive discrete contacts be horizontally remote from at least some of the first set of electrically conductive discrete contacts.

Additionally, Malhi fails to teach such an arrangement of contacts on multiple surfaces of a sheet-like nonconductive structure, wherein some other of the second plurality of contacts are electrically coupled with the first plurality of electrical contacts. Thus, Applicants submit that claim 17 is clearly allowable over Malhi, as Malhi fails to teach all of the limitations thereof.

Applicants further submit that claim 22 through 25 are allowable as being dependent from an allowable base claim as well as for the additional patentable subject matter introduced thereby.

With respect to claim 22, Malhi fails to teach a semiconductor device wherein the adapter is adhesively secured to the die.

With respect to claims 23, Applicants submit that Malhi fails to teach a conductive via extending between at least one of the first plurality of discrete electrical contacts (on the first surface of the sheet-like, nonconductive structure) and at least one of the at least some other of the second plurality of discrete electrical contacts (on the second surface of the sheet-like, nonconductive structure).

With respect to claim 24, Applicants submit that Malhi fails to teach an adapter as set forth in claim 17 which comprises a tape-like structure.

With respect to claim 20, Malhi fails to teach that at least one of the second plurality of discrete electrical contacts is electrically interconnected with a second die.

Applicants, therefore, respectfully request reconsideration and allowance of claims 17 and 22 through 25.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 5,088,190 to Malhi et al., and Further in View of U.S. Patent No. 4,712,129 to Orcutt

Claim 18 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Malhi et al. (U.S. Patent No. 5,088,190), as applied to claim 15 above, and further in view of Orcutt (U.S. Patent No. 4,712,129). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or**

references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

The 35 U.S.C. § 103(a) obviousness rejections of claim 18 is improper because the references relied upon by the Examiner fail to teach or suggest all of the limitations of the presently claimed invention.

Claim 18 of the presently claimed invention depends from claim 15. Claim 18 recites that the adapter set forth in claim 15 further comprises a material having a coefficient of thermal expansion substantially matching the coefficient of thermal expansion of the die. The Examiner relies on Malhi as teaching all the limitations of claim 15, and then cites Orcutt as teaching the matching of coefficients of thermal expansion between various parts of a semiconductor package (Office Action, page 3). The Examiner states that "it would have been obvious to one of ordinary skill in the art at the time of the invention was made to use the matching TCE of Orcutt's in Malhi's in order to prevent the cracking between the die and the substrate." (Office Action, page 3).

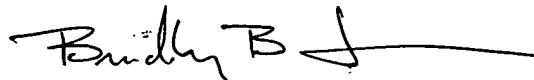
As addressed above with respect to claim 15, Malhi fails to teach or suggest all of the limitations of claim 15. Particularly, Malhi fails to teach or suggest an adapter which includes a sheet-like, nonconductive structure with *a first plurality of discrete electrical contacts on a first surface thereof, and a second plurality of discrete electrical contacts on a second surface thereof, each of said second plurality of discrete electrical contacts having an electrical connection portion and an electrically isolated portion comprising a portion facing said second surface of said adapter and a periphery defined thereabout.* Orcutt likewise fails to teach or suggest such subject matter. Thus, the combination of Malhi and Orcutt fail to teach or suggest all of the limitations of the presently claimed invention as set forth in claim 15.

Applicant, therefore, submits that claim 18 is allowable over Malhi and Orcutt, taken either individually or in combination, and respectfully request reconsideration and allowance thereof.

CONCLUSION

Claims 1 through 4 and 15 through 25 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,

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